EAAE 2008 Congress – Farmers' acceptance of further strengthening of private certification systems

Mondelaers K.[1], Garreyn F. [2] , Steurbaut, W.[2] and Van Huylenbroeck, G.[1]

[1] Department of Agricultural Economics, Ghent University, Ghent, Belgium
[2] Department of Crop Protection, Ghent University, Ghent, Belgium

Abstract— **In their continuous quest for ecologic improvements, private voluntary certification initiatives might undermine the willingness to continue of the participating farmers. In this research, the ecologic contribution and the farmers' acceptance of changing the pesticide policy of a private certification initiative is presented. To measure the perceived farmers' disutility, the choice preference technique is used. We can conclude that there is room for ecologic improvements but that farmers are in general change averse, primarily because of the fear that price compensation will remain largely absent.**

Keywords— **choice preference, pesticides, certification**

I. INTRODUCTION

Recently we see the emergence of private voluntary initiatives for the internalisation of environmental and social issues, mainly because regulatory gains can be made [1][2], sales can increase via differentiation through labelling, the reputation can be enhanced or inputs saved through an optimized resource use. The voluntary character mainly refers to the absence of the use of the State's coercive power, implying that the adoption of the approaches depends on the good-will of the involved actors. The standards applied can be decomposed into sets of rules, which are listed in certification books (or cahiers de charge). Certification itself is the procedure by which a third party gives written assurance that the product, process or service is in conformity with these standards, and it can be seen as a form of communication along the supply chain [3]. The certification books, containing the sets of rules, are social constructs, and reflect the equilibrium of stakes of directly and indirectly involved stakeholders. With stakeholder composition, stakes and power distribution in continuous evolution, this certification book equilibrium is only of a metastable nature. In this paper we suggest adaptations to the pesticide rules of an existing private certification scheme in the fresh vegetable sector in Belgium and discuss the acceptance by the main stakeholder group, the farmers. The private scheme taken as a case study is the FlandriaGAP scheme, which is already an improvement of its predecessor Flandria. This scheme started in 1995 and became the major certification scheme in the Belgian vegetable sector. It offers a guarantee for a high quality product, cultivated in an environmentally friendly way and fully traceable.

One of the spearheads of environmental certification in the vegetable sector is the pesticide policy. The before mentioned scheme targets a reasoned cultivation and as such incorporates several pesticide related rules. Based upon focus group sessions with key stakeholders, improvements in the certification pesticide policy were suggested relating to dose, crop rotation, type of pesticide, origin of propagation material, order of pesticide application, crop resistance and number of treatments. Through multicriteria analysis, the positive contribution to ecological sustainability of these new rules is demonstrated. Clearly, strengthening the certification pesticide policy will not be accepted by the participating vegetable growers, at least if an adequate price compensation is absent. By means of a choice experiment, farmers' disutility and willingness to accept (WTA) of these new rules is measured.

II. THEORETIC FRAMEWORK

Private certification systems that introduce rules to reduce the environmental pressure can be considered as examples of institutions of sustainability (IoS). The latter term was introduced by Hagedorn [4] and refers to sets of rules (constraints) that we impose on our interaction with nature. By making the certification

pesticide policy more restrictive, the farmers internalize part of their external costs. In this context, Hagedorn distinguishes between integrative and segregative institutions, with the former, opposite to the latter, indicating (amongst other) the internalization of gains and costs. When the certification institution, as a set of rules, becomes more restrictive, f.e. in its pesticide policy, then it evolves in the direction of an integrative institution, triggering higher transaction and opportunity costs for the participants, but simultaneously allowing them to reap some reputational gains from the institutional change.

In this paper, the possible improvements in the pesticide policy of an existing private certification scheme were presented to the participating farmers, with the aim of unravelling the 'costs of integration' for the farmers, or the cost for the internalization of part of the external costs. The improvements were obtained by comparing the existing certification scheme with a virtual optimal system, the latter composed of the sets of rules of 'the best available alternatives in the market', according to a series of environmental experts, as explained in section 4.

III. MEASURING THE ECONOMIC ACCEPTANCE BY THE PARTICIPANTS

The basic aim of the Stated Choice technique in this context is to obtain utility estimates for the different options of the certification book rules incorporated in our experiment (i.e. the different attribute levels). This utility measure can then be interpreted (is there a utility difference between the levels?) and used for, for example willingness to accept estimates, simulations and calculations of the effects of marginal changes to these levels. To obtain the utility estimates, multiple choice sets are constructed, each of which constitutes of several alternatives (3 in our experiments). The individual farmers were asked to choose amongst the three alternatives in a choice set their most preferred one. The alternatives on their turn are a combination of several attributes, with each of these attributes having different levels, depending on the choice set. As an example, with farmer 1 choosing alternative 1 in the first choice set, we know he derives a higher utility from the attribute levels of alternative 1 compared to those of alternative 2 or 3. The basic choice model, called the conditional logit choice or multinomial logit (MNL) model [5], has the following functional form:

$$P_i = \frac{1}{\sum_{j=1}^{J} \exp-(V_i - V_j)} \qquad (1)$$

P_i is the probability that alternative i is chosen, V is the deterministic part of utility, function of observed factors. As suggested by [6], the deterministic parts V_{jn} are assumed to be linear, additive functions in the attributes (Xs). Hence, V_{jn} can be written as:

$$V_{jn} = \sum_{k=1}^{K} \beta_k X_{jnk} = \beta' X_{jn} \qquad (2)$$

The β's are estimated by means of conventional maximum likelihood techniques. For an in depth description of the choice preference technique, we refer to [5] or [7].

In January, 2006, 68 farmers residing in the province of Antwerp were personally questioned. Table 1 summarizes the main descriptives and frequencies for the sampled farmer group.

Table 1 Descriptives/frequencies for sampled farmers

Item	Descr.
- Number of farmers	68
- Firm type (combinations possible)	
Open air	8,6%
Greenhouse traditional	40,0%
Greenhouse substrate	65,7%
- Number of crops	
1	74,3%
2	14,3%
more	11,4%
- Principal crop types	
Tomato (and varieties)	51,6%
Lettuce (and varieties)	31,4%

The selection of these farmers was purely at random, based upon visual recognition of the farms. This methodology was used because privacy policy forbids the auctions to make available the addresses of farmers producing under the standard. Because our principal aim was to test the methodology, the selection of farmers was for us of secondary importance. Therefore the results should be taken as

indicative rather than inclusive. The survey consisted of three parts. The first part covered questions concerning personal and farm characteristics of the farmers affiliated to FlandriaGAP. In the second part, the vegetable growers were asked to choose amongst several alternatives based upon changes in the certification book as a whole, while in the third part, they were asked to make a choice amongst several alternatives with attributes only relating to pesticide use reduction.

The choice experiments are built round three scenarios, a base scenario reflecting the current prescriptions level, and two scenarios with more severe prescriptions. The choice experiment attributes and their levels as presented to the farmers were selected based upon the outcome of focus group sessions with farmers, environmental scientists, government officials, vegetable chain members and pressure groups. They imply a further restriction on the pesticide policy within the cahier the charge of the certification standard under study. A further restriction of pesticide use is not warmly welcomed by the majority of the farmers, given the already limited freedom of movement in this area for the gardeners. In Table 2 the selected attributes and their corresponding levels are listed.

The full factorial (i.e. all possible combinations of attribute levels) results into $5 \times 2^8 = 1280$ alternatives. To reduce this number, an orthogonal main effects plan was constructed, which contains a minimum of 16 alternatives for this design. The alternatives in the resulting orthogonal plan are randomly combined without replacement into a choice set of 3 profiles (a base scenario, reflecting the current situation, and 2 hypothetical scenarios). Participating farmers were asked to choose their preferred alternative in each profile set. For the general experiment, 16 profile sets were constructed. To reduce the cognitive burden for the participants due to a high number of choice tasks (16), the design was split into blocks of 4 choice sets per respondent. The farmer was asked to choose amongst A, B, and C, after comparing the different attribute levels.

Table 2 Certification initiative attributes and attribute levels in choice experiment 2

Attributes	Attribute levels
Calculation of dose/ha	*current system (dose and area)* / driving speed and application pressure incorporated
Crop rotation	*Not compulsory* / compulsory if technically feasible
Pesticides allowed	Only SRC* list / *SRC list and positive list, subject to motivation*
Propagation material	Plant passport compulsory / *current level (recommended)*
Choice of pesticide	Follow colour code of SRC / *motivation of choice sufficient*
Choice of crop variety	Minimal dependency on agrochemicals / *several criteria*
Treatments with highly noxious pesticides	Halving of the number of treatments / *current level*
Relative change in price	*0 %* / 0,5 % / 1 %/ 2 %/ 3 %

* SRC: Service for Residue Control
Terms in italic correspond with the current level

IV. MODELLING RESULTS FOR THE ECOLOGICAL CONTRIBUTION AND FARMERS' PREFERENCES

Multicriteria analysis (the revised Simos method, see [8], [9] and [10], is used to determine the relative score of all major Belgian fruit and vegetable certification initiatives on the ecology axis of sustainability. The developed environmental sustainability analysis method is based on an approach already applied in France [11]. For a detailed description, see [12]. In short, expert panels were asked to rank the rules of different certification systems based upon their contribution to the different pillars of ecological sustainability. As such, a hypothetic ideal certification book containing all the best rules of the different initiatives, as well as the relative distance of the existing initiatives from this book, could be determined. The ecological performance measure furthermore allows to evaluate potential improvements of a label, as illustrated in Figure 1. In this figure, the original Flandria certificate rules compared to the FlandriaGAP (this is the EurepGAP aligned version of Flandria) standard and the proposed improved FlandriaGAP' standard are indicated. The proposed improvements were the

criteria used in the choice experiment (CE). By using the scores from the expert panels for the rules integrated in the CE, we are able to calculate the increased beneficial effect on ecology of the introduction of these extra rules. For those rules in the CE that were not integrated in the general checklist, we used the scores of closely related rules (proxies). In total, seven FlandriaGAP-rules were changed.

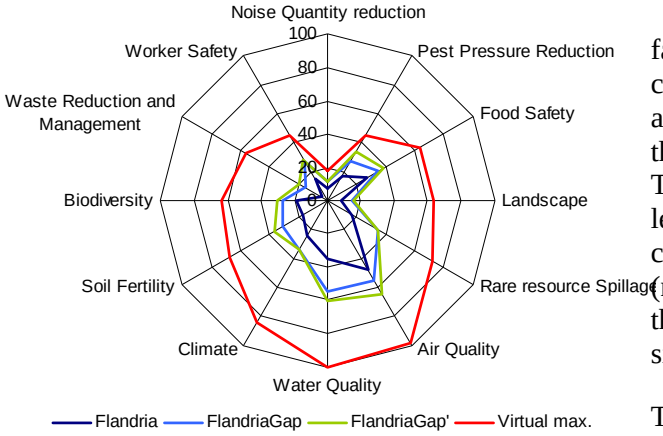

Fig. 1 Performance of the Flandria, the FlandriaGap and the FlandriaGap' standard for ecologic sustainability

As can be seen in Figure 2, although the CE focuses on those measures in the certification book related to pesticide reduction, beneficial effects can be noted for several other environmental sustainability pillars as well.

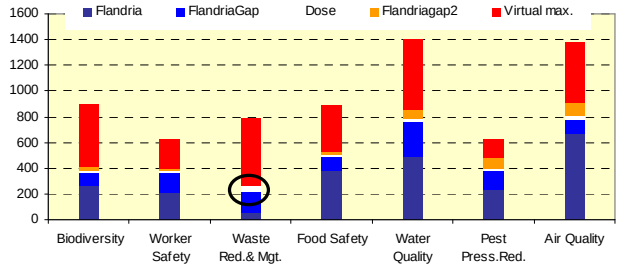

Fig. 2 Effect of dose recalculation on environmental sustainability score of FlandriaGap

Thus, by changing one certification rule, effects resort for different sustainability items simultaneously. As an example, Figure 2 shows the effect on FlandriaGAP's scores of adding the rule '*for the calculation of the pesticide dose, driving speed and application pressure should be taken into account*'. This measure is not that effective for pest pressure reduction, but, unexpectedly, it contributes highly to the 'Waste reduction and management'-pillar (black arrow). Furthermore, the graph shows that the score of the hypothetical FlandriaGap' on Pest Pressure Reduction nearly reaches the virtual maximum score (see the orange arrow). Furthermore, the pillar 'Air Quality' receives the largest contribution from the 7 adapted rules jointly.

Now let us divert our attention to the affected farmer. The Likelihood Ratio test indicates that the choice preference model with parameters for the attributes is a significant improvement compared to the model with constants only (the Base model), see Table 3. Table 4 reports the estimates for the attribute levels. We made use of dummy coding, hence the current situation is considered as having a zero utility (no negative nor positive utility). The table represent the alternative (more restrictive) attribute levels. The significant utility estimates all have the correct sign.

Table 3 LL ratio test for the model CE2

LL model	LLbase model	LL ratio	$X^2_{(6)}$	Sign
-197,91	-217,76	39,7	1,63	yes

Table 4 Modelling results for the Choice Experiment

Attribute	Coeff	S.E.	P	Wta
Calculation of dose/ha	-0.976	0.285	0.001	2.31
Crop rotation	0.224	0.259	0.386	
Pesticides allowed	0.341	0.264	0.196	
Propagation material	-0.725	0.283	0.010	1.71
Choice of pesticide	0.225	0.249	0.366	
Choice of crop variety	-1.033	0.273	0.000	2.44
Treatments with noxious pesticides	-0.451	0.271	0.096	1.07
Relative change in price	0.423	0.125	0.001	
Status Quo	1.049	0.365	0.004	

Remark: attribute levels represent the alternative situation

The status quo coefficient is significant in this experiment, meaning that the farmer, regardless of the attributes, prefers the current situation over the new alternative, and hence is change averse. As was repeatedly indicated during focus group sessions with the farmers, they fear that price compensation for

more restrictive rules will only be of a temporary nature, due to the main retailers' market power.

Based upon the estimates for the choice experiment, the most adverse modification of the certification book from farmers' point of view seems to be the demand to use the crop variety which minimally depends on agrochemicals. Taking into account that this measure is the one that most affects crop yields, this outcome is logic. The other alternative measures are not welcomed either, with recalculation of dose per hectare and documentation for propagation material as most significant ones. The fact that some of the proposed changes result into non significant coefficients is mainly due to the sample constellation, which predominantly constitutes of greenhouse (substrate) gardeners. A more extensive sample will probably yield more significant coefficients.

As an example, the following graph, Figure 3, combines the ecologic and economic effects of introducing the new rule on dose calculation. The ecologic contribution is clearly positive and covers different ecologic sustainability fields. From farmers' (economic) point of view however, the new rule seems disfavourable, as indicated by a negative WTA of more than 2%.

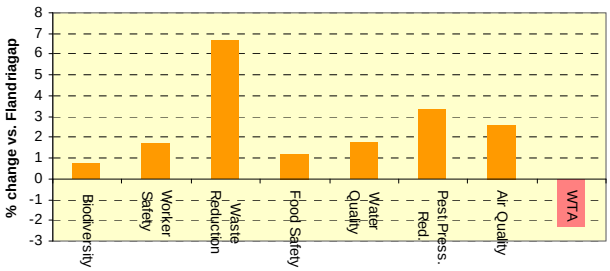

Fig. 3 Impact of the new 'Calculation of dose/ha'- rule on ecology and economy

This negative WTA originates from different economic motivations simultaneously. As farmers are in general change averse, a new rule means the alteration of familiar practises. Secondly, the new rule demands a learning effort from the farmers: how does it need to be applied in practice, what should be calculated, etc. Thirdly, there is a need for investment in the appropriate spraying equipment (whether this is new or adapted equipment). Fourthly, the rule demands extra labour in the field, not only for the calculation of the new doses, but also during application (maintaining the previously calculated speed and spraying pressure). Finally, the rule also increases the registration efforts associated with certification.

V. CONCLUSION CHANGES IN PESTICIDE POLICY

By changing the rule in a certification book into the ecologically most desirable alternative or by adding such a rule, the ecological improvement of the certification standard is unquestionable. The choice experiment made clear that farmers generally strongly advise against changes in the pesticide policy within the certification initiative, because they currently already feel under high pressure from government, society and buyers and thus see ample room for evolution. The resource base of farmers has been narrowed over the years, which is especially true for certified farmers, while the demands have become increasingly stringent. Farmers fear that, due to the market power of buyers, a more demanding certification standard will, in the end, not be compensated by a corresponding farm level price increase. Thus, from a farmer's perspective, the main advantage of moving towards more integrative institutions is absent. However, by following the new rules, market access to preferred sales channels remains open. From a buyer and a society point of view, the new institution is a clear improvement, because external costs are internalized at fairly low costs, with possible reputational gains and without needing restrictive public interference.

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REFERENCES

1. Börkey P, and Lévêque F (1998) Voluntary approaches for environmental protection in the European Union. Working Party on Economic and Environmental Policy integration, OECD, Paris.

2. Börkey P, Glachant M and Lévêque F (1998) Voluntary Approaches for Environmental Policy in OEDC

Countries: An Assessment. CERNA, Centre d'économie industrielle, Ecole Nationale Supérieure des Mines de Paris. 96 p.

3. ISO (1996), ISO Guide 2, International Organization for Standardization, Geneva.

4. Hagedorn, K. (ed) (2002). Environmental Cooperation and Institutional Change: Theories and Policies for European Agriculture (Cheltenham, Edward Elgar)

5. Louvière JJ, Hensher DA and Swait JD (2000) Stated choice methods: analysis and applications, Cambridge University Press, Cambridge.

6. McFadden D (1974) Conditional logit analysis of qualitative choice behaviour. In: PE Zarmbka (ed.), Frontiers of Econometrics, Academic Press, New York.

7. Hensher D, Rose J.M. and Greene W.H. (2005). Applied choice analysis: a primer. Cambridge University Press.

8. Simos J (1990a) L'évaluation environnementale: Un processus cognitive négocié. Thèse de doctorat, DGF-EPFL, Lausanne, 1990.

9. Simos J (1990b) Evaluer l'impact sur l'environnement: Une approche originale par l'analyse multicritère et la négociation. Presses Polytechniques et Universitaires Romandes, Lausanne, 1990.

10. Figueira J, Roy B (2002) Determining the weights of criteria in the ELECTRE type methods with a revised Simos procedure, European Journal of Operational Research, 139, 317-326.

11. Girardin P and Sardet E (2002) Assessment of environmental standards for arable farms, In: W. Lockeretz (Ed), Ecolabels and the greening of the food market. School of Nutrition Science and Policy, Tufts University, Boston Massachusetts, USA, 7-9 November 2002, p. 197-205.

12. Mondelaers K, Garreyn F, Roussel L, Louviaux M, Mormont M, Pussemier L, Steurbaut W and Van Huylenbroeck G (2007) Certified production systems : a way forward to sustainability? in : Van Peteghem et al. (eds.) Towards a safer food supply in Europe. Platform for scientific concertation: Food safety, SPSD II, Belgian Science Policy, ISBN 978-90-8756-032-4.

- Author: Koen Mondelaers
- Institute: Department of Agricultural Economics Ghent University
- Street: Coupure Links 653
- City: Ghent
- Country: Belgium
- Email: Koen.Mondelaers@ugent.be